

What is claimed is:

1. A method of detecting a substrate in a carrier head for a chemical mechanical polishing system, comprising:

5 connecting a chamber in a carrier head to a pressure source;
measuring the pressure in the chamber as a function of time;
calculating the derivative of the pressure in the chamber; and
determining whether the substrate is adjacent a substrate receiving surface in the carrier head from the derivative.

10 2. The method of claim 1, further comprising indicating that the substrate is present if the derivative exceeds a critical value.

15 3. The method of claim 1, further comprising indicating that the substrate is absent if the derivative does not exceed a critical value.

4. The method of claim 1, wherein the carrier head includes a plurality of chambers and the chamber is a first chamber from the plurality of chambers.

20 5. The method of claim 4, further comprising applying a vacuum to a second chamber in the carrier head.

6. The method of claim 5, wherein the second chamber surrounds the first chamber.

25 7. The method of claim 5, wherein the carrier head includes a first membrane extending below a base to provide the first chamber and a second membrane extending below the first membrane to provide the second chamber.

8. The method of claim 7, wherein connecting the first chamber in the carrier head to the pressure source causes a lower surface of the first membrane to press on an upper surface of the second membrane.

5 9. The method of claim 5, wherein a rigid member forms a boundary between the first and second chambers.

10. The method of claim 5, wherein a flexible member forms a boundary between the first and second chambers.

10 11. The method of claim 5, wherein the second chamber forms a generally annular volume.

15 12. The method of claim 5, wherein the second chamber forms a generally solid volume.

20 13. The method of claim 1, wherein the carrier head includes a membrane extending below a base to provide the chamber, a lower surface of the membrane providing the substrate receiving surface.

25 14. A chemical mechanical polishing apparatus, comprising:
a pressure source;
a carrier head having a chamber connected to the pressure source and a substrate receiving surface to hold a substrate;
a sensor to measure the pressure in the chamber and generate a signal;
a controller to receive the signal from the sensor and configured to
calculate the derivative of the pressure in the chamber as a function of time,
and
determining whether the substrate is adjacent the substrate receiving surface
30 from the derivative.

15. The apparatus of claim 14, wherein the controller is configured to indicate that the substrate is present if the derivative exceeds a critical value.

16. The apparatus of claim 14, wherein the controller is configured to indicate that
5 the substrate is absent if the derivative does not exceed a critical value.

17. The apparatus of claim 14, wherein the carrier head includes a plurality of chambers and the chamber is a first chamber from the plurality of chambers.